

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application No. : 10/541,715 Confirmation No. : 9810
Applicant : Martin Hermann Weggen et al.
Filed : December 29, 2005
Title : DEVICE AND METHOD FOR ENCAPSULATING
WITH ENCAPSULATING MATERIAL AND
ELECTRONIC COMPONENT FIXED ON A
CARRIER
Group Art Unit : 2813
Examiner : Stephen W. Smoot
Customer No. : 28289

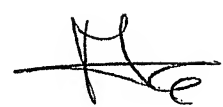
Commissioner for Patents
P. O. Box 1450
Alexandria, VA 22313-1450

DECLARATION UNDER 37 CFR § 1.132

Polderdijk 83
1. I am a citizen of The Netherlands, and a resident of Herwen. I have worked for Fico B.V., which is the assignee of the above-identified application, for 14 years and have 14 years of experience in the design of molding devices and equipment used for encapsulating electronic components.

2. I am one of the inventors of the subject matter disclosed and claimed in the above-identified patent application.

3. The claimed invention has been commercially implemented by the Assignee under the trade name AMS-W. The AMS-W molding system, as shown in the attached brochure, includes a first mould part and a second mould part that are displaceable relative to each other. The AMS-W molding system further includes feed means for encapsulating material connecting onto a projective edge. The projecting edge forms a stationary assembly with the first mould part. Further, the first mould part receives a support



for the carrier that is displaceable relative to the edge. Thus, a carrier is positioned on the support part, which is moved in the first mould part towards the projecting edge that is kept stationary. During operation of the AMS-W molding system, the carrier is placed on the first mould part such that the projecting edge connected to the first mould part lies on the side opposite the side of the carrier supporting on the first mould part. The distance between the projecting edge and the support part of the first mould part supporting the carrier is reduced such that a part of the carrier is clamped between the part of the first mould part supporting the carrier and the projecting edge. In particular, the support part is moved in the first mould part towards the projecting edge that is kept stationary. Further, the second mould part is closed onto the first mould part such that a mould cavity is formed closing onto the carrier, Liquid encapsulating material is fed to the mould cavity.

4. I have reviewed International Publication Number WO 01/17012 to Peters et al., which is relied upon in the Office Action dated January 12, 2009. The Peters reference, in which Fico B.V. is the Applicant, was commercially implemented by the Assignee under the trade name AMS-F. The AMS-F molding system includes first and second mould parts with a holder member positioned between the first and second mould parts. In the AMS-F molding system, the carrier is positioned on the first mould part, as opposed to being positioned on a movable support part of the mould part as in the AMS-W system embodying the claimed invention, and a projecting edge portion of the holder member is moved towards the first mould part to clamp the carrier between the projecting edge and the first mould part.

5. The Assignee sold approximately six AMS-F molding systems. The AMS-F molding system did not achieve commercial success and production of the AMS-F system has been stopped and is no longer offered for sale by the Assignee. The Assignee sold at least thirty AMS-W molding systems. The Assignee estimates that about 100-300 AMS-W systems will be sold and production of the AMS-W system will continue. The initial sales prices for the AMS-F and the AMS-W molding systems as well as the advertising and marketing expenditures for the AMS-F and the AMS-W molding systems are substantially the same. Moreover, because the AMS-F and the AMS-W molding systems are both offered by Fico B.V., the higher sales of the AMS-W molding system is not due to the

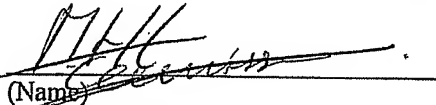


market position or brand name recognition of the Assignee. The foregoing information is indicative of the commercial success of the claimed invention.

6. The advantageous features of the claimed invention, as embodied by the AMS-W molding system, contribute to the commercial success of the present invention in the market place. More specifically, customers appreciate the fact that the claimed invention, embodied by the AMS-W molding system, positions the carrier on a support part displaceable within one of the mould parts for clamping against a stationary projecting edge rather than positioning the carrier on the mould part as disclosed in the Peters reference and embodied by the AMS-F system. If the customer desires to change to a different package height, due to the claimed features of the present invention, only the top mould part of the AMS-W system needs to be exchanged rather than replacing both mould parts as required in the AMS-F system. Further, moving the support part of the AMS-W system towards the projecting edge to clamp the carrier allows the claimed invention to be provided symmetrically, *i.e.*, on either side of the plunger for the encapsulating material, such that the clamping force against the carrier can be provided independently for the left and right carriers. Moreover, moving the support part into contact with the projecting edge as in the AMS-W system, as opposed to moving the holder into contact with the carrier positioned on the mould part as in the AMS-F system, allows the moving or clamping part to be free from contact with the encapsulating material thereby reducing the chance of delamination.

7. I further declare that all statements made herein of my own knowledge are true and that all statements made on formation and belief are believed to be true and, further, that these statements are made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment or both, under § 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Michel H. L. Teunissen


(Name)

May 7, 2009
Date

Topedge molding

Side rail flash

On standard molds compound is injected into the cavity from the side of the board. Even the smallest irregularity to the board causes side rail flash. In all next process steps this causes pollution. With topedge molding, Fico offers you a solution without any side rail flash.

Standard molding

In a standard Fico mold, the compound is transferred through runners over the leadframe and then into the package. On the final products, these runners need to be removed by degating.

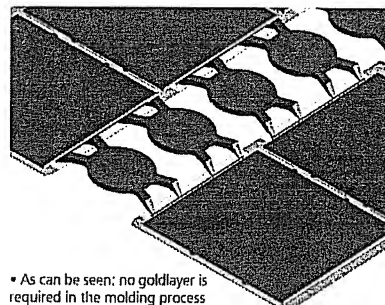
To be able to degate the runners, two important demands are made on the leadframe and runner. First of all the runner must be thick enough so that it can be degated from the molded leadframe. Secondly, a gold layer must be present on a BGA board to be able to degate the product and prevent delamination. To bypass the above demands, Fico uses topedge molding.

Topedge molding

With topedge molding, the product is clamped under a topedge strip. This topedge strip fulfills the function of both gold layer and runner. The compound is transferred through the topedge strip, instead of the board. Since there is no contact between the compound and the runner, no goldlayer is necessary.

Gold layer

Since topedge molding does not require the use of a gold layer on your boards, a significant cost reduction is achieved. A typical gold layer is responsible for 20% of the cost of ownership of a product!



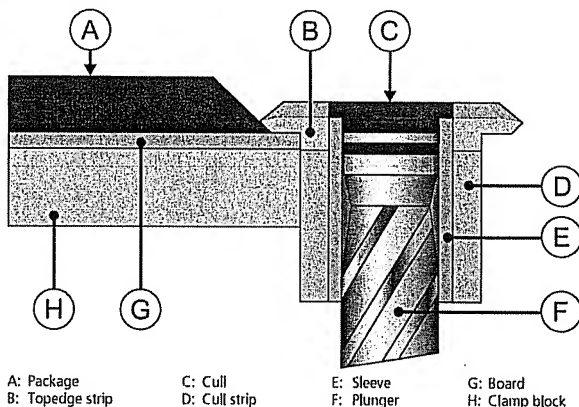
• As can be seen, no goldlayer is required in the molding process

Compound

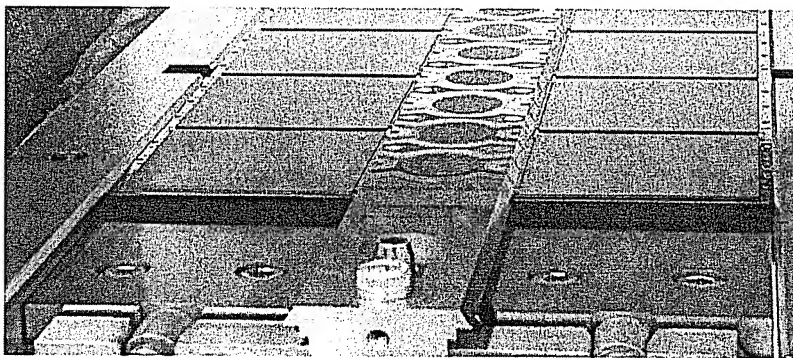
Not only the gold layer gives a significant reduction in the cost of ownership for a product. On a conventional mold cull strength is necessary for degating. Not when topedge molding is used. Injection channels and cull can be thinner, resulting in a compound reduction of up to 25%.

Degating

Another advantage of the topedge molding principle is that hardly any force is necessary for degating. The large flat thin gate at the end of the topedge strip allows easy degating of the products.



A: Package
B: Topedge strip
C: Cull
D: Cull strip
E: Sleeve
F: Plunger
G: Board
H: Clamp block



• The topedge construction as it is used in the AMS-W molding system

Availability

The topedge molding principle is available on the AMS-W molding system. It can be used on a wide range of products (QFN, BGA, BOC and BGA-MAP). This includes high end applications like flip chip, multi chip array and stacked die.

Information

Is topedge molding interesting for your application? A demonstration on a running topedge system?

For more information, contact the Fico sales department at sales@fico.nl.